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Embryology in wax

Michael Dietrich
Dartmouth College

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Embryos in Wax: Models from the Ziegler Studio by Nick Hopwood
Whipple Museum of the History of Science, 2002. £13.50 pbk (x + 206 pages)
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In Cambridge University's Whipple Museum there is a somewhat macabre collection of embryonic models rendered in wax. Like other nineteenth century scientific instruments, these wax embryos appear at first glance as curious artifacts – beautifully crafted, but scientifically ambiguous. Fortunately, Nick Hopwood's companion to this collection, *Embryos in Wax*, expertly demonstrates the central place of these models in the practice and history of embryology.

Crafted by Adolf Ziegler and later Friedrich Ziegler, his son, the embryonic models are the material embodiment of some of the nineteenth century's most significant biological theories. First produced as teaching tools, the Ziegler models gained importance as Darwinism transformed embryology. Models, such as the series on the development of the frog embryo, were used to 'discipline the eye', teaching students how to recognize different stages and structures, especially microscopic structures. By the late nineteenth century, however, Zeigler's models became a means of 'publishing in plastic', as they literally became the embodiment of cutting edge scientific theories, such as Wilhelm His's theory of chick development or Ernst Haeckel's theory of gastrulation. Hopwood's careful historical contextualization of these artifacts reveals how the Zeiglers crafted both the models and their scientific legitimacy.

Historians and philosophers of science often think of models as intermediate representations connecting theory and Nature. Because models are intended to represent only particular aspects of Nature, they are the partial embodiment of natural relations. By abstracting away features of the phenomena, they focus and train our attention. Hopwood's expert of analysis of the collaborative process between Ziegler and scientists such as His reveals how scientific theories of embryology, with their own particular representations of Nature and natural relationships, became sealed in wax. Zeigler's models taught students to recognize features of embryonic development that had already been privileged by his collaborator's theories. As such, Ziegler's models could be an example of what Margaret Morrison calls mediating models – models that are both theory and data driven which often themselves become the objects of scientific research. Under the rubric of this analysis, Ziegler's wax models are transformed from embodiments of theory and Nature to instruments for further scientific research.

Embryos in Wax is an engaging and richly illustrated analysis of an important aspect of the heydays of evolutionary and experimental embryology. As such, Nick Hopwood has made a significant contribution to the history of embryology and the study of the material culture of science. Those seeking even more scholarly analysis of Ziegler's models and their scientific context should seek out Hopwood's excellent articles on the subject [1,2].

Michael R. Dietrich
Dept of Biological Science, Dartmouth College, Hanover, NH 03755, USA.
e-mail: Michael.Dietrich@Dartmouth.edu

References

1 Hopwood, N. (2000) Producing development: the anatomy of human embryos and the norms of Wilhelm His. *Bull. History Med.* 74, 29–79
2 Hopwood, N. (1999) 'Giving body' to embryos: modeling, mechanism, and the microtome in late nineteenth century anatomy. *Isis* 90, 462–496

Erratum

Galis, F. *et al.* (2002) Conservation of the segmented germband stage: robustness or pleiotropy? *Trends Genet.* 18, 504–509
Figure 3 is not the correct figure, for which we apologize. It should be:

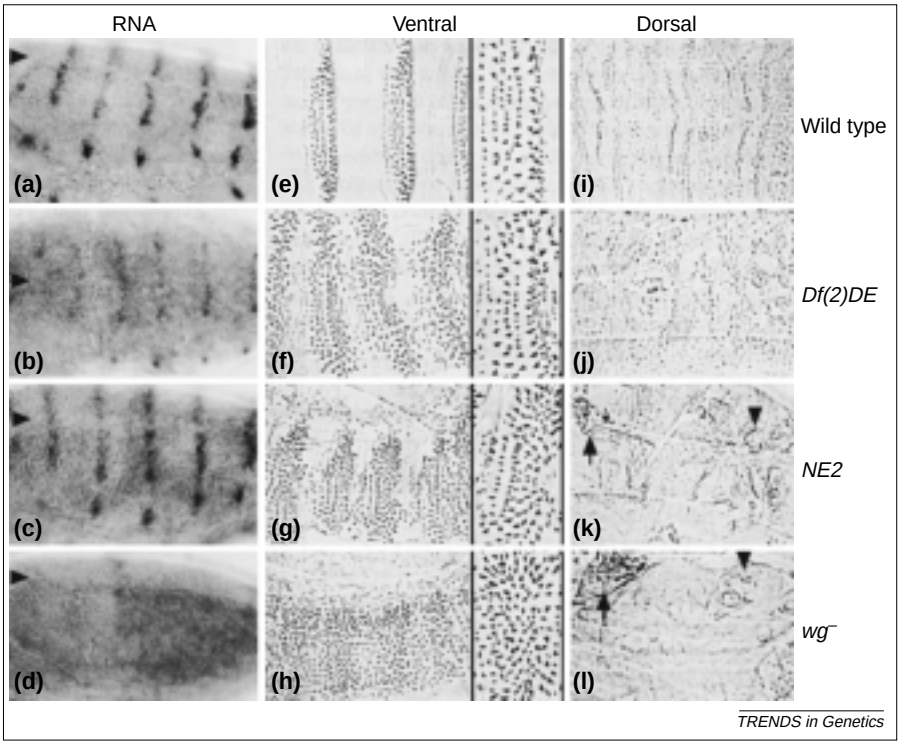

Fig. 3. Null ($wg^{-/-}$), reduced [Df(2)DE] and partial (NE2) function mutations of the *wg* gene lead to abnormalities in the larval ectoderm. Expression of *wg* in the ectoderm (A–D), and cuticular pattern in the ventral (E–H) and dorsal (I–L) larval epidermis (W.T. denotes wild type). In Df(2)DE mutants, *wg* expression is reduced, and in NE2 mutants, *wg* transport is hampered (reproduced, with permission, from Dierick, H.A. and Bejsovec, A. [1998] Functional analysis of Wingless reveals a link between intercellular ligand transport and dorsal-cell-specific signaling. *Development* 125, 4729–4738).

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